6. Marine Mammals

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6-1 Killer Whale, Orca

6-1.1 Species Name

Orcinus orca

Common Name: Killer whale, Orca

Initial coverage recommendation: Evaluation

6-1.2 Status and Rank

See glossary for listing and ranking definitions and criteria.

FEDERAL STATUS

Not listed

National Oceanic and Atmospheric Administration (NOAA) Fisheries determined that the southern resident killer whales form a distinct population segment and has recommended that they be listed as Threatened under the Endangered Species Act (ESA) (50 CFR 223 [2004]).

WASHINGTON DEPARTMENT OF FISH AND WILDLIFE STATUS

Endangered

NATURAL HERITAGE PROGRAM GLOBAL RANK

G4, G5

NATURAL HERITAGE PROGRAM STATE RANK

S1, S2

6-1.3 Range

Killer whales are more commonly found within 800 kilometers of coastlines and are more abundant at higher latitudes, probably because of higher prey abundances. The species has the broadest distribution of any dolphin (Reeves et al. 2002; Wiles 2004) and occurs within all marine waters of Washington, spending most of late spring through fall around the San Juan Islands (Wiles 2004). At other times of the year, the whales leave the area or stay along the outer coast.

Three distinct forms of killer whales occur in Washington (Krahn et al. 2002; Wiles 2004,) and, although they have overlapping distributions they are genetically different (Hoelzel et al. 1998). All three types were seen annually off the northwest coast of Washington between 1989 and 2002 (Calambokidis et al. 2004).

- **Resident** killer whales occur primarily in near-coastal and inland waters from central California to southeast Alaska (Wiles 2004), feeding on salmon and other fish (Ford et al. 1998). Two principal groups of this form are known: northern residents, which generally occur from central Vancouver Island to southeastern Alaska (Wiles 2004); and southern residents that live most of the year in inland areas around the Strait of Juan de Fuca, the Strait of Georgia and Puget Sound (Krahn et al. 2002). Southern resident killer whales may also occur off the Washington outer coast and can be found from central California to the Queen Charlotte Islands (Krahn et al. 2004; Wiles 2004). The northern resident group has recently been separated into four distinct populations: one in western Alaska, two in southern to southeastern Alaska, and one in British Columbia (Krahn et al. 2004). Southern residents comprise three pods that are named with the letters "J," "K" or "L" (Wiles 2004).

  All three southern resident killer whale pods inhabit waters in the Georgia Strait, the Strait of Juan de Fuca and around the San Juan Islands (i.e., the Georgia Basin) during late spring to fall, although the J pod exhibits a somewhat different occupancy pattern. K and L pods arrive first in the Basin, usually by May or June, and stay until October or November (Wiles 2004). The J pod frequents Puget Sound and the Georgia Basin sporadically during the summer and is the only group to swim among the San Juan Islands with any regularity.

- **Transient** killer whales are found from southern California to the northern Gulf of Alaska (Wiles 2004) and feed primarily on marine mammals and sea birds (Baird and Dill 1995, 1996; Ford et al. 1998). This form does not interact with other killer whale groups and typically travel in small groups consisting of fewer than ten individuals. Transient killer whales roam parts of the Strait of Juan de Fuca, Puget Sound and the Georgia Basin, often remaining for extended periods in locales where harbor seals are abundant.

- **Offshore** killer whales may visit coastal and inland areas, but are more typically found more than 15 kilometers away from land (Krahn et al. 2002). They range from the eastern Aleutians to southern California and feed primarily on fish.

The focus of this paper is on the transient and resident forms that occur within the State of Washington's waters.

6-1.4 Habitat Use

Killer whales' habitat use is not restricted by factors such as salinity, temperature or depth, and the species ranges throughout the deep waters of the open ocean, as well as shallow inland and even intertidal waters (Baird 2001; Wiles 2004). Mating probably occurs between May and October, but may happen year round (Wiles 2004) with

gestation lasting approximately 17 months. Resident whale populations give birth from October to March and calves stay with their mothers for the first year after birth. Females typically give birth to their first young at about 12 years of age, although they probably mature at a slightly younger age (Wiles 2004). Males mature at an average age of 15 years and may live 50 to 60 years, reaching lengths of 9 meters and weights of 5,600 kilograms (Reeves et al. 2002). Females are generally smaller (7.9 meters long, weight 3,500 kilograms) than males, but may live 80 to 90 years (Reeves et al. 2002).

RESIDENT

Killer whales in the Georgia Basin do not generally enter water less than 5 meters deep, spending most of their time in deeper waters. Their distribution is strongly associated with salmon abundance, although there is some disagreement over specific feeding habitat. Baird (2001) described studies indicating that southern resident killer whales feed in high-relief areas, such as canyons, ridges and steep slopes that might limit fish movements and help the whales herd fish, while Ford et al. (1998) found no such association between feeding and bottom topography. While preferred prey for resident populations consists of Chinook salmon (*Oncorhynchus tshawytscha*) they also take coho (*O. kisutch*), pink (*O. gorbuscha*), chum (*O. keta*), steelhead (*O. mykiss)* and sockeye (*O. nerka*) (Wiles 2004). Little information exists regarding consumption of other fish species or the animals feeding habits while outside the region (Wiles 2004)

TRANSIENT

Within the Georgia Basin, transient killer whales inhabit a wide range of water depths, but may stay in shallow waters for some time, often entering intertidal habitats near pinniped haulouts to feed at high tide (Baird 2001). Some groups of transient whales may be found in the Puget Sound/Georgia Basin area throughout most of the year, whereas other pods only frequent the area in late summer when seal pups are plentiful (Baird and Dill 1995). Transients appear to be more common in the northern parts of the region, primarily off Vancouver Island, the San Juan Islands and into the Strait of Juan de Fuca (Wiles 2004). However, Wiles (2004) described several unpublished accounts of three groups of transients occurring in the Hood Canal region for an extended period of time in 2003, apparently remaining to feed on the harbor seals living in the canal. Wiles also noted that prior to 2003, sightings in Hood Canal were rare and had only included a few individual whales. This pattern of an extended stay in Hood Canal also occurred in 2004 and 2005 (Calambokidis, Personal communication. May 19, 2005).

6-1.5 Population Trends

World-wide estimates of Orca populations are not generally reliable because the species widespread distribution and movement patterns make them difficult to census (Baird 2001; Wiles 2004).

RESIDENT

While no reliable data exists for resident populations in the British Columbia-Washington region before 1974 (Wiles 2004), there are indications that the southern resident

population was much larger than it is now and may have included more than 200 individuals. A retrospective model projection showed that the population probably increased in the early 1960s possibly in response to a decrease in incidental shootings (Wiles 2004). The population then decreased sharply from 1967 to about 1972 because of the impact of the live-capture fishery, and gradually increased through about 1995 to 1996 when it again began a steady decline. Following a slight increase from 2000 through 2003, a direct count of southern resident whales listed the minimum population estimate at 83 whales (Carretta et al. 2004; Wiles 2004) - a population size comparable to that of the early 1960s. Since monitoring began in 1974 there has been no incidental take of southern resident whales by commercial fisheries (Carretta et al. 2004) and during the same time period pods J and K increased by about 31 to 47 percent, while pod L has only increased 5 percent and is showing a decade-long decline (Wiles 2004). Krahn et al. (2002, 2004) modeled survival data for the southern resident group and found that the population showed constant rates within a 6-year period, but that consecutive periods differed from each other. Abundances were low from 1980 to 1984 and from 1993 to 2000, and were high from 1974 to 1979 and 1985 to 1992, showing a slight increase of 4 whales from 2000 to 2003 with no differences in the patterns among pods (Krahn et al. 2002, 2004).

The most recent stock assessment for the northern resident population (British Columbia to Alaska) was for 2001 (Angliss and Lodge 2004) and gave a population estimate of about 723 whales, which was also considered the minimum population estimate. However, data were not sufficient to evaluate population trends.

TRANSIENT

While the most recent stock assessment for the total transient population listed both the minimum population estimate and direct population count at 346 whales (Angliss and Lodge 2004), there were no reliable data to examine population trends.

OFFSHORE

It is not easy to accurately estimate the size of the offshore population, because it is difficult to distinguish stocks from photographs, and not all individuals have been photographed (Baird 2001, Carretta et al. 2004). No population trends are available for the offshore population, but the 2003 population size was estimated to be about 466 individuals (Carretta et al. 2004), with a minimum population estimate of 361 whales.

6-1.6 Assessment of Threats Warranting ESA Protection

DESTRUCTION, MODIFICATION, OR CURTAILMENT OF HABITAT OR RANGE

Permanent, or longer-term, habitat destruction is generally much less of an issue for large whales than relatively shorter-term catastrophic events, such as a major oil spill (Clapham et al. 1999). In addition to resulting in direct mortality, killer whales may be indirectly affected by oil spills through breathing petroleum vapors or by eating

contaminated prey (Wiles 2004). Because of their relatively small preferred range, resident killer whales in the Georgia Basin-Puget Sound area may be particularly vulnerable to oil spills. Wiles (2004) compiled a list of major oil spills within the Washington portion of the killer whale range, reporting that 15 spills greater than 100,000 gallons have occurred in the area between 1964 and 1999, or about 1 spill every 2.3 years. Most spills were from ships, but also occurred from refineries and pipelines. Since 1999, Washington has kept a rescue tug in Neah Bay during the winter to assist vessels that become disabled in the heavy winter seas off the coast. No major spills have occurred since then.

OVERUTILIZATION FOR COMMERCIAL, RECREATIONAL, SCIENTIFIC OR EDUCATIONAL PURPOSES

One of the most significant threats to killer whale survival was couched as an educational or entertainment activity. The capture of live animals for display in aquariums began slowly in 1962, but increased considerably in the late 1960s (Baird 2001; Wiles 2004). Although it lasted only about 10 years, this live-capture fishery severely depleted killer whale populations in the northeast Pacific, especially the highly vulnerable southern resident killer whales. Public pressure eventually brought the fishery to a halt in the United States and Canada in the late 1970s, but the impact on the southern resident killer whales was great with about 70 percent of the 275 to 307 whales collected from the area members of the southern resident population. It took about 20 years for the population to recover (Baird 2001; Wiles 2004). Live-capture continues in other regions (for example, Iceland, Japan and Argentina Russia), but is less intense than that in the 1970s (Wiles 2004).

People also enjoy observing animals in their native environs and a substantial tourist industry has built up around "whale-watching" centers worldwide. Within the Georgia Basin the whale watching industry has grown so much that from April through October killer whales are followed throughout much of the day by watercraft (Wiles 2004). Studies investigating the impacts of whale watching on the animals have documented underwater noise from vessel motors reaching about 175 decibels (Wiles 2004), with the noise generated by a fast-moving vessel was likely audible to whales at a distance of at least 16 kilometers (Erbe 2002). While effects induced by slower moving boats were lower, documented noise levels masked whale calls at a distance of 14 kilometers and caused changes in behavior at 200 meters, with hearing loss possible with exposure to fast-moving vessels. There are currently no regulations that apply to whale-watching, although NOAA Fisheries has developed general guidance for observing marine mammals in the northwest Pacific (Carlson 2004). In addition, the Whale Watch Operators Association Northwest has established a set of Best Practice Guidelines for viewing killer whales, baleen whales, pinnipeds and birds to "minimize potential negative impacts on marine wildlife populations…" and to provide the "best viewing opportunities" to allow watchers to enjoy and learn about the wildlife (Whale Watch Operators Association Northwest 2003). The potential impacts of some of the procedures typically contained in existing guidelines were tested by Williams et al. (2002) in waters off northern Vancouver Island. In addition to changes in killer whale behavior consistent with avoidance, the study found that certain whales may have become habituated to the presence of the vessels, and recommended using slow parallel approaches to mask propeller noise.

DISEASE OR PREDATION

Predation does not represent a significant threat to killer whales as they do not have any natural predators other than humans. Sharks may kill some small whales, but the impacts on killer whale populations are not important. In addition, human "predation" has decreased substantially since the 1960s and 1970s (Baird 2001; Wiles 2004).

There is not much information about disease risks in free-ranging killer whales. While a recent literature-based survey identified the occurrence of 2 bacteria (*Brucella* and *Edwardsiella tarda)* and a virus (cetacean pox) in wild populations, none of the three has a high potential to cause an epidemic among killer whales (Gaydos et al. 2004). Nonetheless, all three can have significant effects on individual killer whales with *Brucella* reducing fecundity and *Edwardsiella* leading to highly virulent form of gastroenteritis. Cetacean pox virus is highly virulent in young cetaceans and could be an important cause of mortality. *Brucella* antibodies were found in a transient killer whale stranded on the Dungeness Spit near Sequim, Washington, in 2002. Because transients and southern resident killer whales often overlap in occurrence, the presence of *Brucella* in a transient whale indicates that southern resident killer whales could also be exposed to the bacterium (Gaydos et al. 2004).

The small number of pathogens identified from killer whales, especially North Pacific populations, probably reflects lack of sampling and knowledge rather than low pathogen diversity or incidence (Gaydos et al. 2004). Killer whale carcasses are rarely recovered and, therefore, relatively few pathological studies are performed. Diseases affecting fecundity, such as *Brucella*, could impact overall population viability in long-lived killer whales. Small population size and the highly interactive social structure make virulent, contagious pathogens severe threats to southern resident killer whales. Highly virulent cetacean morbillivirus antibodies have been found in related northeastern Pacific common dolphins (Gaydos et al. 2004), but it is not known whether killer whales are susceptible to this virus. Herpesviruses are not yet known from Pacific whales, and killer whales are not known to be susceptible to them, yet these viruses could adversely affect killer whales because they do cause severe outbreaks in some odontocetes.

ADEQUACY OF EXISTING REGULATORY MECHANISMS

While killer whales are protected under a number of agreements and acts, none of the existing mechanisms offer complete protection from human predation. The International Whaling Commission prohibits taking killer whales on factory ships, with additional protection provided under the Convention on International Trade in Endangered Species of Wild Fauna and Flora agreement (CITES), United States Marine Mammal Protection Act and the Canadian Marine Mammal Regulations. However, CITES and both the Canadian and U.S. Acts include provisions for collection and/or hunting of limited numbers of animals under specific conditions (Baird 2001). Southern resident populations would see additional protection as a result of a recent recommendation that they be listed as Threatened under the ESA (50 CFR 223 [2004]).

OTHER FACTORS AFFECTING CONTINUED EXISTENCE

A number of additional factors may affect both transient and resident killer whale populations, including:

- Fluctuations in the abundance of key prey species such as seals and salmon leading killer whales to switch from a high-energy prey to one of lower energy. The resulting increase in foraging effort may potentially leading to reduced fecundity and higher death rates.

- Potential effects from inbreeding as a result of small population size. The southern resident killer whale population, which has only 28 reproductive individuals, including only 9 males (Krahn et al. 2004; Wiles 2004), could be approaching the level at which inbreeding depression could adversely affect the population.

- Bioaccumulation of toxins. Similarly to other long-lived, top-level predators, killer whales represent the final step in food web contaminant pathways and contaminant burdens born by North Pacific killer whales have been the subject of several studies summarized by Wiles (2004) and Krahn et al. (2004). Ross et al. (2000) and Hayteas and Duffield (2000) described high levels of organochlorine contaminants such as polychlorinated biphenyls (PCBs) and *p,p'*-DDE in killer whales from British Columbia and Oregon, respectively, with PCB concentrations among the British Columbia whales much higher that those reported for marine mammals from other parts of the globe. There were also significant differences among population groups and between genders - transients had higher concentrations than southern residents, which, in turn had higher concentrations than northern residents, and body burdens on males were higher than those in females (Ross et al. 2000). Both PCB concentrations in, and the differences among transient and resident populations were linked to diets comprised of higher level predators (seals, sea lions and salmonids) that accumulate contaminants (Ford et al. 1998; Ross et al. 2000) Differences between the two resident groups may be related to geographic differences in ranges, with the southern resident living near more industrialized coastlines. The specific PCB congener profiles for both transient and resident populations were surprisingly similar given the differences in prey consumed (Ross et al. 2000). Whales found stranded in Oregon, which were thought to be transients, also had very high concentration of PCBs the organopesticide *p,p'*-DDE (Hayteas and Duffield 2000). Killer whales are also facing new threats from contaminants such as those used as flame retardants and endocrine disrupting chemicals (Krahn et al. 2004).

- Noise pollution. Anthropogenic increases in noise greatly exceed background noise levels and are likely to interfere with sound waves used by marine mammals for communication, prey detection and navigation. In addition to noise from whale-watching, marine mammals are impacted by noise associated with commercial and military vessels, sonar, oil exploration and production, and acoustic harassment devices used in aquaculture operations. Sonar may be particularly disruptive, as it is designed to produce sounds of at least 225 decibels that can be detected at distances up to about 30 kilometers (Wiles 2004) and may cause severe damage, including brain hemorrhaging (Wiles 2004) in cetaceans. Acoustic harassment devices used to keep pinnipeds away from aquaculture pens some fishways emit noise levels sufficient to cause a major shift in habitat use by killer whales of northeastern Vancouver Island (Morton and Symonds 2002; (Wiles 2004). While the use of seismic technology associated with oil

exploration may be detrimental to transient and offshore killer whale populations, it is not likely to affect resident killer whale populations.

6-1.7 Assessment of Potential Effects from Washington DNR Authorized Activities

Killer whales, especially the southern resident killer whales and transients, are common in Puget Sound and other Washington coastal and inland waters throughout much of the year. Therefore, there is the potential for activities authorized by Washington DNR to affect killer whales. Direct impacts could result from new overwater structures and shoreline modifications reducing salmon or pinniped habitats; shifts in habitat use as a result of the use of acoustic harassment devices near aquaculture facilities; and injuries to whales from collisions with vessel traffic associated with marinas and ferry terminals. In addition Killer whales may be indirectly affected by activities such as discharges from outfalls or runoff from impervious surfaces, that increase contaminant loads in the prey. The potential for activities authorized by Washington DNR to adversely impact offshore killer whales is probably relatively low because those whales do not frequently enter state waters. Those that do enter state waters could be affected by many of the activities that affect resident and transient killer whales.

6-1.8 Species Coverage Recommendation and Justification

SOUTHERN RESIDENT

Southern resident killer whales are recommended as a **Covered Species** because: 1) The southern resident killer whale population has been proposed for listing under the Endangered Species Act and is listed as Endangered by the State of Washington; 2) Activities authorized by Washington DNR have a "high" potential to affect the group; and 3) Sufficient information is available to assess impacts and to develop conservation measures.

TRANSIENT

Transient killer whales are recommended as an **Evaluation Species** because: 1) Transient killer whale populations are not listed by either the federal or state government; 2) Activities authorized by Washington DNR have a "high" potential to affect transient killer whales; and 3) Sufficient information is available to assess impacts and to develop conservation measures.

OFFSHORE

Offshore killer whales are recommended as an **Watch-list Species** because: 1) Offshore killer whale populations are not federally listed; 2) Activities authorized by Washington

DNR have a "low" potential to affect this group; and 3) Insufficient information is available to assess impacts and to develop conservation measures.

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6-2 Humpback Whale

6-2.1 Species Name

Megaptera novaeangliae

Common Name: Humpback whale

Initial coverage recommendation: Evaluation

6-2.2 Status and Rank

See glossary for listing and ranking definitions and criteria.

FEDERAL STATUS (NOAA FISHERIES)

Endangered (1970)

WASHINGTON DEPARTMENT OF FISH AND WILDLIFE STATUS

Endangered

NATURAL HERITAGE PROGRAM GLOBAL RANK

G3

NATURAL HERITAGE PROGRAM STATE RANK

SZN

6-2.3 Range

The humpback whale is distributed worldwide and frequently occurs in coastal waters (Wynne 1997; Clapham et al. 1999). Calambokidis et al. (2001) asserts that based on wintering populations in Japan, Hawaii and Mexico there are at least three distinct subpopulations in the North Pacific and that humpback management would be better served by considering six subpopulations derived by subdividing the Japan and Mexico wintering areas. Eight feeding areas are identified, all of which are located in the northeast Pacific from California to the Aleutian Islands (Calambokidis et al. 2001).

Humpback whales off Washington appear to belong to either an aggregate population that extends southward from Washington to California or one that encompasses northern Washington and southern British Columbia (Calambokidis et al. 2004a, Calambokidis et

al. 2004b). While there appears to be little interchange among animals from the various feeding areas, (Calambokidis et al. 2001, Calambokidis et al. 2004b) feeding area boundaries are not clearly defined and the ranges of feeding aggregations may overlap (Calambokidis et al. 2004a).

Humpback whales have primarily been observed off the central and northern reaches of the Washington coast (Calambokidis et al. 2004; Carretta et al. 2004), with a detailed, ship-based study defining the primary area inhabited as near the edge of the continental shelf between 125 and 126 degrees west longitude, more than 20 kilometers off Cape Flattery (Calambokidis et al. 2004). While a few whales were observed closer to shore, they were still likely to be outside Washington State waters.

While humpback whales were once common in Puget Sound and sighted as far south as Henderson Inlet (Scheffer and Slipp 1948), their current populations are generally restricted to the main channels (Osborne, Personal communication. March 15, 2005). Although a few sightings have been made north of the San Juan Islands and in the northern portion of Admiralty Inlet, most sightings occur in Canadian waters between Port Angeles, Washington, and Victoria, British Columbia. The species may have recently become more common in Puget Sound, with six confirmed sightings in San Juan County from 1998 through 2003 (Whale Museum 2005) and additional sightings in 2004 of individuals in the southern Sound documented by Falcone et al. (2005) in 2004.

6-2.4 Habitat Use

Humpback whales have the most varied diet of any of the baleen whales, feeding on several planktonic crustacean groups (euphausiids, mysids, pelagic amphipods and copepods) and several species of schooling fish (e.g., herring, anchovies, walleye pollock and Atka mackerel) (National Marine Fisheries Service, 1991). Because their prey are small, humpback whales must consume large quantities of individual prey and feeding areas are likely to be associated with oceanographic conditions and topographic features that concentrate plankton into dense aggregations. The primary habitat used off Washington is near the edge of the continental shelf between 125 and 126 degrees west longitude, more than 20 kilometers off Cape Flattery (Calambokidis et al. 2004).

Both males and females of this species reach sexual maturity at about 7 years of age, with females reproducing every 2 to 4 years. Calves are born in the tropics after a one-year gestation period, and although the calves are weaned within 11 months they may stay with their mother of over a year. Humpback whales may reach 17 meters in length, weigh 40,000 kilograms and live at least 50 years (Reeves et al. 2002).

6-2.5 Population Trends

Pre-whaling populations of humpbacks planet wide have been estimated at over 100,000, (National Parks Conservation Association 2005), with eastern North Pacific stocks estimated at 15,000 (Carretta et al. 2004). By the time whaling stopped in the mid-1960s, the population had been reduced to about 1,200 (Carretta et al. 2004).

Ship-based surveys and mark-recapture studies both indicate that eastern North Pacific stocks have increased steadily since whaling stopped, with current populations numbering about 6,000 (Calambokidis and Barlow 2004; Carretta et al. 2004). In waters off Washington, the humpback whale population appeared to show a dramatic increase in numbers in 2002 (Calambokidis et al. 2004a), a change that may also have been reflected in the increase in sightings within Puget Sound (Falcone et al. 2005; Whale Museum 2005).

6-2.6 Assessment of Threats Warranting ESA Protection

DESTRUCTION, MODIFICATION, OR CURTAILMENT OF HABITAT OR RANGE

Migratory species like humpbacks may be affected by long term habitat modification from activities such as oil exploration, as well as by short term loss of key resources. However, permanent habitat destruction is generally much less of an issue for large whales than relatively shorter-term catastrophic events, such as a major oil spill (Clapham et al. 1999).

OVERUTILIZATION FOR COMMERCIAL, RECREATIONAL, SCIENTIFIC, OR EDUCATIONAL PURPOSES

Commercial whaling initially focused on the humpback whale because of its affinity for coastal areas (Clapham et al. 1999) and Scheffer and Slipp (1948) report that over 70 percent of the whales processed in Grays Harbor between 1911 and 1925 were humpbacks. By the time commercial harvest stopped in 1965, stocks were so depleted that a ban on taking humpback whales went into effect in 1966 (Carretta et al. 2004). However, humpbacks are still occasionally taken for subsistence off Bequia in the Caribbean (Clapham et al. 1999).

DISEASE OR PREDATION

There are no known instances of epidemic disease among baleen whales (Clapham et al. 1999). While there are no indications that predation has an important impact on humpback populations, Steiger and Calambokidis (2000) recorded scars that were attributed to unsuccessful predatory attacks by killer whales on the flukes of 30% of the mature humpback females they observed.

ADEQUACY OF EXISTING REGULATORY MECHANISMS

The regulatory prohibitions implemented in the 1960s appear to be adequate to keep the impacts from whaling to a minimum. Subsistence whaling on humpback whales should not adversely affect the species (Clapham et al. 1999). Although not regulatory, the implementation of a Take Reduction Plan in 1997 has reduced the potential for humpback whale entanglement in fishing gear from the United States gillnet fishery.

OTHER FACTORS AFFECTING CONTINUED EXISTENCE

There are several additional factors that may affect the continued existence of humpback whales, including:

- Increases in the occurrence of harmful algal blooms. A major stranding of 14 humpback whales on Cape Cod was linked to saxitoxin, a poison produced by dinoflagellates associated with red tides, in mackerel that had been eaten by the whales (Geraci et al. 1989).

- Collisions with ships. The occurrence of humpback whales in the proximity of a major shipping lanes such as the Strait of Juan de Fuca, makes them vulnerable to collisions with large vessels, especially container ships (Clapham et al. 1999), and whale mortalities are known to have occurred as a result of such collisions. NOAA Fisheries estimated that between 1997 and 2001, ship strikes accounted for about 0.2 humpback deaths per year (Carretta et al. 2004).

- Entanglement. Baleen whales are subject to becoming entangled in the vast array of fishing gear used by modern fishing fleets. While entanglement does not immediately cause mortality, it can lead to eventual starvation by impairing a whale's feeding ability (Clapham et al. 1999). From 1997 through 2001, there were no mortalities to eastern North Pacific humpback whale populations from entanglement with gear from the drift gillnet fishery (Carretta et al. 2004), a decrease that may be related to NOAA Fisheries 1997 Take Reduction Plan.

- Chemical contamination. The potential impacts of contaminants on humpback whales is relatively unclear. A study of 25 live humpback whales in the Gulf of St. Lawrence showed that the main contaminant loads were pesticides (mainly DDT) and PCBs (Metcalfe et al. 2004). No significant differences were detected between the loads carried by juveniles and females; no males were sampled. Importantly, this study documented that contaminant concentrations in young-of-the-year (i.e., unweaned) calves were similar to those in females, emphasizing maternal transfer as a pathway for bioaccumulation of pollutants. A single humpback whale that stranded along the central California coast was found to have accumulated relatively low levels of PCBs and pesticides; much lower than those found in stranded gray whales or sea lions sampled during the same study (Kannan et al. 2004). While it is clear that humpback whales can accumulate organic contaminants, the potential impacts of these compounds on the whales remains unclear.

6-2.7 Assessment of Potential Effects from Washington DNR Authorized Activities

The numbers of eastern North Pacific humpback whales that enter waters of the State are relatively small. However, a recent increase in sightings of humpback whales within Puget Sound may indicate that the whales are returning to an area in which they were once relatively common (Falcone et al. 2005) and the potential exists for some activities authorized by Washington DNR to affect this species. Specific affects include alteration

of prey habitat from new overwater structures and/or shoreline modifications, injury or changes in habitat use resulting from acoustic harassment devices near aquaculture facilities, and injury due to collisions with vessel traffic associated with marinas and ferry terminals. Although the effects of contaminants and algal blooms is unclear, the potential also exists for waste- and stormwater discharges to affect humpbacks through ingestion of contaminated prey and/or toxic algal compounds

6-2.8 Species Coverage Recommendation and Justification

It is recommended that the humpback whale be considered an **Evaluation Species** because: 1) The humpback whale is listed as Endangered by both the United States government and the State of Washington; 2) Activities authorized by Washington DNR have a "low" potential to affect humpback whales; and 3) Sufficient information is available to assess impacts and to develop conservation measures. Should humpbacks become more common in Puget Sound, it will be necessary to obtain data concerning their populations, locations and frequency of occurrence, and to re-evaluate this coverage recommendation.

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6-3 Sea Otter

6-3.1 Species Name

Enhydra lutris (Enhydra lutris kenyoni)

Common Name: Sea otter, northern sea otter, Alaskan sea otter

Three subspecies have been identified; the southern sea otter, *Enhydra lutris nereis*, the northern (Alaskan) sea otter, *E. l. kenyoni*, and the Asian (northern) sea otter, *E. l. lutris* (Lance et al. 2004). Because the common name "northern" sea otter is used for the Alaskan and Asian sea otters, the subspecies discussed in this paper, *E. l. kenyoni*, will be referred to only as the sea otter.

Initial coverage recommendation: Evaluation

6-3.2 Status and Rank

See glossary for listing and ranking definitions and criteria.

FEDERAL STATUS

Not listed

WASHINGTON DEPARTMENT OF FISH AND WILDLIFE STATUS

Endangered

NATURAL HERITAGE PROGRAM GLOBAL RANK

G4 (*E. lutris*); G4, T4 (*E. l. kenyoni*)

NATURAL HERITAGE PROGRAM STATE RANK

S1 (*E. lutris*); S3? (*E. l. kenyoni*)

6-3.3 Range

The sea otter (*Enhydra lutris*) ranges widely across the rim of the North Pacific, extending from Baja California northward to Alaska and across the Aleutian Islands to Kamchatka and the northern tip of Japan (Richardson and Allen 2000; Reeves et al. 2002). Evidence from early fur trading expeditions indicate that sea otters may have been distributed from the mouth of the Columbia north and into the Strait of Juan de Fuca

as far east as Discovery Bay (Lance et al. 2004), however their current range stretches from about Destruction Island northward along the outer coast to Cape Flattery and into the Strait of Juan de Fuca as far east as Pillar Point (Richardson and Allen 2000; Jameson and Jeffries 2001).

6-3.4 Habitat Use

Sea otters use shallow coastal waters within 1 to 2 kilometers of shore and are generally associated with rocky (consolidated) substrates where kelp is present (Richardson and Allen 2000; Lance et al. 2004). While generally found in the water, sea otters will occasionally rest on offshore rocks and islands or mainland beaches (Lance et al. 2004). Sea otters feed on the surface, but prey on a variety of benthic invertebrates found in and near kelp beds, including echinoderms (sea urchins, sea cucumbers and sea stars), molluscs (clams, chitons and octopus) and crabs (Richardson and Allen 2000). Most foraging occurs at depths of between 2 and 30 meters, although feeding forays have been documented at depths of 100 meters (Bodkin et al. 2004).

Female sea otters are sexually mature at 4 to 6 years of age, with males maturing at 5 to 6 years of age and reproducing successfully 2 to 3 years later after they have established territories (Lance et al. 2004). Although the species may mate year round, peak mating activity occurs in the fall with about half of sea otter births occurring 6 months later during February, March and April (Lance et al. 2004).

Sea otters may reach a length of 1.5 meters, weigh 45 kilograms and have life spans of 15 to 20 years, with females slightly smaller and longer lived than males (Reeves et al. 2002; Lance et al. 2004).

6-3.5 Population Trends

While historic populations of sea others in the North Pacific have been estimated at between 100,000 to 300,000, by the time harvest ceased in 1911 the population had been reduced to fewer than 2,000 animals (Richardson and Allen 2000). Reintroduction and conservation efforts throughout the species range steadily increased the species numbers and in the year 2000 sea otter populations were estimated at over 100,000 (Richardson and Allen 2000). While the southwest Alaska stock has experienced a sharp decline in abundance since 1965 (US Fish and Wildlife 2002a), 2 additional Alaskan stocks, as well as the British Columbia sea otter population have shown increasing population trends (Watson et al. 1997; US Fish and Wildlife 2002b, 2002c).

There are no numeric estimates of pre-harvest sea otter populations in Washington and the species was extirpated from the state shortly after 1911 (Richardson and Allen 2000). During 1969 and 1970, 59 animals were reintroduced off the Olympic Peninsula and although at least 16 of those animals died not long after being released (Lance et al. 2004), populations gradually increased to about 100 animals in 1988 (Richardson and Allen 2000). Population estimates based on surveys conducted in 2003 and 2004 indicated that the sea otter population in Washington has increased to about 672 to 743

individuals (Lance et al. 2004), with the animals range expanding northward (Kvitek et al. 1998; (Laidre et al. 2002).

6-3.6 Assessment of Threats Warranting ESA Protection

DESTRUCTION, MODIFICATION, OR CURTAILMENT OF HABITAT OR RANGE

Sea otters in Washington primarily occupy rocky habitats with kelp (Lance et al. 2004), in a relatively restricted part of the outer coast and the western Strait of Juan de Fuca. As a result, the species is particularly vulnerable to anthropogenic loss of habitat. However, because most of the animal's current range is within federally protected areas, the potential for loss is considered minimal except for losses attributable to catastrophic events.

OVERUTILIZATION FOR COMMERCIAL, RECREATIONAL, SCIENTIFIC OR EDUCATIONAL PURPOSES

Commercial harvest of sea otters for their pelts probably began in Washington with the earliest explorers and became so intense that the otter population in the state was extirpated by the early 1900s (Richardson and Allen 2000). While there is currently no legal sea otter hunt in Washington, Native Americans on the Olympic Peninsula historically hunted otters and the right has been reserved in treaties made with the tribes (Richardson and Allen 2000).

DISEASE OR PREDATION

Although sea otters are preyed on by bald eagles (primarily pups), killer whales and sharks, predation by non-humans is not usually a major threat (Richardson and Allen 2000). However, Alaskan populations of sea otters have seen significant increases in predation by killer whales as a result of a decrease in the abundance of traditional Orca prey items such as sea lions and seals (Estes et al. 1998).

Recently encephalitis attributed to *Sarcocystis neurona,* a protozoan found in the fecal matter of opossums, birds and horses, was discovered in a young male that stranded on Roosevelt Beach (Lindsay et al. 2001). This individual also had toxoplasmosis, which is caused by *Toxoplasma gondii*, a protozoan found in cat feces. In central California, 76 percent of the otters living near sources of heavy freshwater runoff had *Toxoplasma* antibodies (Anonymous 2003) and the disease is thought to be a contributing factor to the population declines in California sea otters. Sea otters most likely become infected by eating clams that filter and retain the protozoan cysts from the water.

ADEQUACY OF EXISTING REGULATORY MECHANISMS

Although sea otters are not listed under the Endangered Species Act, they are afforded protection by the Marine Mammals Protection Act and are listed as Endangered by the State of Washington. In addition, the species primary habitat is located within the boundaries of the Olympic Coast National Marine Sanctuary, and much of the shoreline adjacent to these habitats is part of the Olympic National Park. The potential for

incidental take by gill-net fisheries has been reduced by a prohibition on the use of gill nets, except those allowed by treaty provisions, within the current sea otter range (Richardson and Allen 2000). However, as the range of the sea otter in Washington expands, the level of take may increase unless the gill-net prohibition is concomitantly extended.

OTHER FACTORS AFFECTING CONTINUED EXISTENCE

There are several additional factors that may affect sea otters, including:

- Oil spills associated with the high volume of shipping traffic off the Olympic Peninsula. Catastrophic spills pose a significant risk and may constitute the greatest risk for Washington's sea otters (Gerber et al. 2004). Richardson and Allen (2000) reviewed some of the potential impacts of oil spills on sea otters and found that in addition to oil fouling the otter's dense fur, thereby reducing its insulating ability and causing death from exposure, sublethal exposure to oil could induce chronic pathologies.

- Entanglement in gill nets and other small-mesh fishing gear had significant impacts on sea otters in California (Richardson and Allen 2000) and led to restrictions on the mesh size that could be used in shallow water within the sea otter range. Although all gill nets except those used by Native Americans are prohibited within the range of Washington's sea otters, the likelihood of entanglement may increase as populations expand beyond the Olympic Marine Sanctuary and National Park. Sea otters also may be caught in shrimp and crab traps, although no fatalities in Washington have been reported (Richardson and Allen 2000).

- Resource competition with humans. Sea otters are extremely successful predators and as their range expands it may lead to conflicts with humans over decreases in wild stock sea urchin (of the Class Echinoidea), Dungeness crab (*Cancer magister*) and razor clam (*Siliqua patula*) fisheries (Richardson and Allen 2000), as well as increasing impacts to cultured or enhanced fisheries (Nash et al. 2000).

- Inbreeding. The sea otter population presently occupying Washington waters was derived from the 40 or so otters translocated to the state, leaving the population susceptible to reduced genetic variability and an increased likelihood of an inbreeding depression that could impede the population's survival and expansion (Larson et al. 2002). However, a recent study showed that genetic variability in translocated sea otter populations, including the Washington stock, was not reduced from that occurring in the parent populations and that the small size of the founding Washington population contributed to some genetic divergence from its parent population from Amchitka, Alaska (Larson et al. 2002). Thus, the apparent bottleneck related to translocation was short and not likely to adversely affect reestablishment.

- Illegal shooting, collisions with boats and injuries caused by boat propellers may affect sea otters, but are not yet significant issues for Washington sea otters (Richardson and Allen 2000).

6-3.7 Assessment of Potential Effects from Washington DNR Authorized Activities

While the current range of sea otters in Washington makes them unlikely to be affected by activities authorized by Washington DNR, an expansion of their range would increase the likelihood. Potential affects include decreases in kelp habitat from overwater structures, increases in mammal pathogens from storm- and wastewater discharges, and increases in human predation as a result of sea otter predation on aquaculture operations.

6-3.8 Species Coverage Recommendation and Justification

It is recommended that the sea otter be treated as an **Evaluation Species** because: 1) While the sea otter is not federally listed, it is considered Endangered by the State of Washington; 2) Activities authorized by Washington DNR have a "low" potential to affect sea otters; and 3) Sufficient information is available to assess impacts and to develop conservation measures.

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6-4 Steller Sea Lion

6-4.1 Species Name

Eumetopias jubatus

Common Name: Steller sea lion, Northern sea lion

Initial coverage recommendation: Evaluation

6-4.2 Status and Rank

See glossary for listing and ranking definitions and criteria.

FEDERAL STATUS (NOAA FISHERIES)

Threatened (Alaska, California, Oregon, Washington, British Columbia; 1990)

WASHINGTON DEPARTMENT OF FISH AND WILDLIFE STATUS

Threatened

NATURAL HERITAGE PROGRAM GLOBAL RANK

G3

NATURAL HERITAGE PROGRAM STATE RANK

S2N

6-4.3 Range

The Steller sea lion occurs primarily in coastal waters from central California to Hokkaido, Japan (National Marine Fisheries Service 1992; Reeves et al. 2002). Two stocks are recognized within United States waters: a western U.S. Stock that ranges from Cape Suckling in Alaska, west through the Aleutian Islands to the Bering Sea; and an eastern U.S. Stock that ranges from Cape Suckling east and south to central California (Calkins et al. 1999; Angliss and Lodge 2004). Only the eastern stock will be discussed in this paper.

A relatively small population of Steller sea lions occurs in Washington waters and while there are no breeding sites in the state, haulout sites are located along the outer coast from the Columbia River north to Cape Flattery and Tatoosh Island (Jeffries et al. 2000).

Steller sea lions also haulout on the Vancouver Island side of the Strait of Juan de Fuca and are occasionally observed on Puget Sound navigation buoys (Jeffries et al. 2000).

6-4.4 Habitat Use

Steller sea lions use two primary types of shore-based habitats: rookeries and haulout sites. Rookeries are breeding areas that are usually located on isolated sandy beaches, while haulouts are located in rocky areas, beaches, reefs, breakwaters, jetties, navigational devices and docks (National Marine Fisheries Service 1992). Adults generally stay within 500 kilometers of their natal rookery, returning to breed at or near the same site throughout their lives (NOAA Fisheries 2001). Male and female Steller sea lions may both reach a length of about 3 meters, with males weighing about 1,100 kilograms at maturity and surviving into their mid-teens. Females are considerably smaller (about 350 kilograms), but may reach 30 years of age (NOAA Fisheries 2001; Reeves et al. 2002).

While both males and females reach sexual maturity at about 3 to 8 years, females may not successfully pup until year 4 and males generally lack the size needed to defend breeding territories until they are about 9 years of age (NOAA Fisheries 2001). Females give birth from May to July, with mating occurring 1 to 2 weeks after birth (NOAA Fisheries 2001). Pups are weaned within 11 months and little is known about the behavior or movements of juveniles (NOAA Fisheries 2001). Steller sea lions feed on a wide variety of fish (e.g. sand lance [*Ammodytes hexapterus*], greenling [*Hexagrammos spp, and Oxylebius pictus*], herring [*Clupea pallasii*], smelt, walleye pollock [*Theragra chalcogramma*], salmonids [*Oncorhynchus* spp.]), as well as cephalopods (NOAA Fisheries 2001) and diet varies geographically and seasonally with prey availability (Reeves et al. 2002). While predation by great white sharks (*Carcharodon carcharias*) and killer whales (*Orcinus orca*) occurs, the rate of predation varies geographically and seasonally (NOAA Fisheries 2001).

6-4.5 Population Trends

Steller sea lion populations in the United States declined by about 70 to 75 percent from the late 1970s to the late 1990s, with the trend being more severe for the western U.S. stock (Trites and Larkin 1996; Calkins et al. 1999). While the underlying causes of the decline are not well understood, the most plausible explanations appear to be nutritional stress resulting from dramatic changes in prey abundance and/or relative composition; and a sequential shift in the diet of killer whales from other whale species, to small seals, Steller sea lions and sea otters (Benson and Trites 2002; Springer et al. 2003; Trites and Donnelly 2003).

However, the eastern stock considered in this paper, has shown an increasing population trend since 1982 (Trites and Larkin 1996, Calkins et al. 1999, Angliss and Lodge 2004), with numbers increasing from about 15,000 to 22,000 individuals. The Steller sea lion stock assessment is based primarily on animals at rookeries and haulout sites and does not provide separate population trends for the animals occurring in Washington. Trends

for the areas adjacent to Washington have been steady (Oregon) or increasing (British Columbia) since 1982 (Angliss and Lodge 2004). Angliss and Lodge (2004) reported 523 Steller sea lions counted in Washington in 1996, although that number was based on the 2001 stock assessment. However, as many as 1,000 individuals may occur in the state during the fall and winter (Jeffries et al. 2000).

6-4.6 Assessment of Threats Warranting ESA Protection

DESTRUCTION, MODIFICATION, OR CURTAILMENT OF HABITAT OR RANGE

Permanent or longer-term habitat destruction is probably a relatively minor issue for Steller sea lions because of the relative remoteness of primary rookeries or haul-outs. However, relatively shorter-term catastrophic events, such as a major oil spill could have severe effects on sea lion populations. Although clear links between oil spills and major population impacts have not been established, oils spills are still a concern (COSEWIC 2003).

Although Steller sea lions may acclimate to repeated disturbances, rookery and haul-out habitat may be either degraded or curtailed by repeated aircraft over-flights, interruptions by boat traffic and pedestrians, and by fishing activities, (COSEWIC 2003).

OVERUTILIZATION FOR COMMERCIAL, RECREATIONAL, SCIENTIFIC OR EDUCATIONAL PURPOSES

While small subsistence harvesting is allowed under the Marine Mammal Protection Act, Steller sea lions are not currently subject to threats related to commercial overutilization. There are no known recreational, scientific or educational uses for Steller sea lions.

DISEASE OR PREDATION

While the overall impacts of diseases on Steller sea lion populations are difficult to evaluate diseases are not currently thought to be a threat to Steller sea lion populations (National Marine Fisheries Service 1992; Trites 2005). However, increases in predation as a result of shifts in shark or killer whale diets could have severe impacts to Steller sea lion populations. Williams et al. (2004) calculated that the 170 mammal-eating killer whales estimated to frequent the Aleutians, could consume up to 40,000 Steller sea lions annually. In addition, while transient killer whales in Puget Sound/Georgia Basin waters feed primarily on harbor seals, they have also been observed taking Steller sea lions (Baird and Dill 1995, Ford et al. 1998).

ADEQUACY OF EXISTING REGULATORY MECHANISMS

Existing protections derived from the U.S. Marine Mammal Protection Act, the Endangered Species Act, and commercial fishing regulation appear to be adequate for the protection of Steller sea lion populations in Washington.

OTHER FACTORS AFFECTING CONTINUED EXISTENCE

Barron et al. (2003) summarized the literature on tissue contaminant loads in Steller sea lions and reported that butyltins, mercury, PCBs, DDTs, chlordanes and hexachlorobenzene had been identified in the tissues. They also reported that Steller sea lion habitats and prey are contaminated with additional chemicals including pesticides and metals, and that haulouts and rookeries are located near other hazards including radioactivity, solvents, ordnance and chemical weapon dumps. However, no adverse affects have been documented (Barron et al. 2003) and the potential effects of contamination are unknown.

Steller sea lion ranges shift with prey populations and it is likely that they will increasingly encounter and forage in aquaculture operations. As a result they may also be at risk from human predation. British Columbia currently allows sea lions to be killed as part of the Aquaculture Anti-predator Program (Angliss and Lodge 2004), with at least 316 Steller sea lions killed under this program from 1999 to 2000 (COSEWIC 2003).

6-4.7 Assessment of Potential Effects from Washington DNR Authorized Activities

The limited numbers and range of Steller sea lions in Washington reduces the likelihood that activities authorized by Washington DNR will adversely impact the species. However, activities such as marinas or transfer terminals may increase the potential for oil spills, while storm- and wastewater discharges may increase the potential for contaminants to affect the species. Aquaculture facilities are not currently found within the primary range of the species in Washington.

6-4.8 Species Coverage Recommendation and Justification

It is recommended that the Steller sea lion be treated as an **Evaluation Species** because: 1) The Steller sea lion is listed as Threatened by both the state and federal government; 2) Activities authorized by Washington DNR activities have a "low" potential to affect Steller sea lions; and 3) Insufficient information is available to assess impacts or to develop conservation measures.

6-4.9 References

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6-5 Blue Whale

6-5.1 Species Name

Balaenoptera musculus

Common Name: Blue whale

Initial coverage recommendation: Evaluation

6-5.2 Status and Rank

See glossary for listing and ranking definitions and criteria.

FEDERAL STATUS (NOAA FISHERIES)

Endangered (1970)

WASHINGTON DEPARTMENT OF FISH AND WILDLIFE STATUS

Endangered

NATURAL HERITAGE PROGRAM GLOBAL RANK

G3, G4

NATURAL HERITAGE PROGRAM STATE RANK

Not ranked

6-5.3 Range

The blue whale occurs throughout the world's oceans, and while it is a migratory species it is rarely found in coastal areas. Blue whales found off the coats of Washington are likely part of the northeastern Pacific population that migrates from wintering grounds off Mexico and Central America to summer/fall feeding areas in higher latitudes, particularly off California and Vancouver Island, British Columbia (Burtenshaw et al. 2004; Carretta et al. 2004). Acoustic data from arrays placed at six locations along the Pacific Coast showed that blue whales migrate northward from feeding grounds in California beginning in June and pass Washington from September through February, but are probably well offshore (Burtenshaw et al. 2004). Modeling efforts, although focused on British Columbia waters, also indicated a low probability for the occurrence of blue whales off

Washington (Gregr and Trites 2001) and it seems unlikely that they occur within Washington State waters.

6-5.4 Habitat Use

Blue whales are highly selective plankton feeders, primarily consuming euphausiid crustaceans (Fiedler et al. 1998; Moore et al. 2002) and are most frequently associated with oceanographic conditions and topographic features that concentrate plankton into dense aggregations. Thus, they occur in cold, highly productive waters such as areas of strong coastal upwelling or sea-surface temperature fronts (Fiedler et al. 1998, Moore et al. 2002; Burtenshaw et al. 2004).

6-5.5 Population Trends

Barlow et al. (1994) reported that it appeared that blue whale abundance increased off the coast of California through about 1991, although this may have reflected increased use of California feeding grounds rather than in increase in the population, and there is no indication the population has increased since (Calambokidis et al. 2004a). There are no separate population data for blue whales occurring near Washington and surveys conducted between 1989 and 2002 failed to document the animals off Washington (Calambokidis and Barlow 2004; Calambokidis et al. 2004b; Carretta et al. 2004).

6-7.6 Species Coverage Recommendation and Justification

It is recommended that the blue whale be addressed as a **Watch-list Species** because: 1) The species has a low probability of occurring in Washington waters; and 2) Insufficient information is available to assess impacts or to develop conservation measures.

6-5.7 References

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6-6 Bowhead Whale

6-6.1 Species Name

Balaena mysticetus

Common Name: Bowhead whale

Initial coverage recommendation: Evaluation

6-6.2 Status and Rank

See glossary for listing and ranking definitions and criteria.

FEDERAL STATUS (NOAA FISHERIES)

Endangered (1970)

WASHINGTON DEPARTMENT OF FISH AND WILDLIFE STATUS

Not ranked

NATURAL HERITAGE PROGRAM GLOBAL RANK

G3

NATURAL HERITAGE PROGRAM STATE RANK

Not Ranked

6-6.3 Range

The bowhead whale has a circumpolar distribution (Shelden and Rugh 1995) with two of the five recognized stocks occurring in the North Pacific. The Okhotsk Sea stock spends summers in the Okhotsk Sea, but its winter range is not well understood (Shelden and Rugh 1995). The Bering Sea stock spends summers in the Beaufort Sea, with uncommon occurrences in the Chukchi Sea, and winters in the southwestern Bering Sea (Shelden and Rugh 1995; Wynne 1997).

There are no reliable records of this species occurring in Washington and its presence is likely accidental.

6-6.4 Habitat Use

Bowhead whales are strongly associated with ice (Wynne 1997), particularly marginal ice fronts and areas of open water surrounded by sea ice, in the Bering Sea (Shelden and Rugh 1995).

6-6.5 Population Trends

By the time commercial whaling stopped in 1914, bowhead whale populations were severely depleted. The Okhotsk Sea stock is a small population of about 300 to 400 whales that has shown little recovery (Shelden and Rugh 1995). The Bering Sea stock, also known as the western Arctic stock, is the largest of the five world-wide stocks, with a population estimated at about 8,200 individuals (Raftery and Zeh 1998). The apparent recovery shown by this stock led Shelden et al. (2001) to suggest that the five stocks be considered separately for ESA listing and that the Bering Sea stock should be delisted.

6-6.6 Species Coverage Recommendation and Justification

It is recommended that the bowhead whale be considered a **Watch-list Species** because: 1) The species does not occur in Washington State waters.

6-6.7 References

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6-7 Gray Whale

6-7.1 Species Name

Eschrichtius robustus

Common Name: Gray whale

Initial coverage recommendation: Evaluation

6-7.2 Status and Rank

See glossary for listing and ranking definitions and criteria.

FEDERAL STATUS

Not listed - Eastern North Pacific Stock (Delisted 1994)

WASHINGTON DEPARTMENT OF FISH AND WILDLIFE STATUS

Sensitive

NATURAL HERITAGE PROGRAM GLOBAL RANK

G4

NATURAL HERITAGE PROGRAM STATE RANK

S?B

6-7.3 Range

While gray whales historically occurred in both the north Atlantic and Pacific Oceans, only two stocks remain - one in the western North Pacific and one in the eastern North Pacific (Reeves et al. 2002; Angliss and Lodge 2004). Only the eastern stock occurs within the waters of Washington State, migrating between 16,000 and 22,000 kilometers from their calving grounds off Baja California to their feeding grounds in the Chukchi and Bering.

A small portion of the eastern North Pacific stock takes up residency in the Pacific Northwest during the summer feeding season. Although these seasonal residents are known to range from southeast Alaska to northern California, the focal point of the residency seems to be along the Washington coast to central Vancouver Island

(Calambokidis and Quan 1999; Gosho et al. 1999; Calambokidis et al. 2002) and many of the same whales reappear across years. Migration northward begins in February with seasonal residents arriving in Washington at about the time the overall migratory group reaches the area and leaving when the main southward migration passes in the fall (Calambokidis et al. 2002). Gray whales may also enter Willapa Bay and Grays Harbor (Richardson 1997), with Calambokidis et al. (2002) recording seven individuals in Grays Harbor from late March to early May during their 1998 study.

6-7.4 Habitat Use

Eastern gray whale populations primarily forage on the highly productive sea floor in the Bering and Chukchi Seas (Highsmith and Coyle 1992; Rugh et al. 1999). Feeding sites typically include larger bays with shallow waters and sandy bottoms, and generally extending from the intertidal zone to a depth of about 30 meters. While primary benthic prey include amphipods (*Ampelisca*) and ghost shrimp (*Callianassa*) (Dunham and Duffus 2001), gray whales may shift between planktonic and benthic feeding, depending on the availability of prey.

The prey and habitats exploited by the seasonal resident group in the Washington-British Columbia area appear to be more diverse than those of whales feeding in Arctic waters (Darling et al. 1998; Dunham and Duffus 2001), and are easily grouped into three types: herring eggs and larvae, planktonic prey and benthic prey (Darling et al. 1998). Whales off the coast of Washington generally remain within 5 kilometers of shore foraging in waters about 20 meters deep (Calambokidis et al. 2004). While foraging behavior is less understood for those gray's entering Puget Sound, animals in the northern Sound appear to show strong, but temporary site fidelity (Calambokidis and Quan 1999), while those in the southern Sound often experience high rates of mortality.

Gray whales may reach a length of 15 meters, weigh 35,000 kilograms and live at least 40 years (Reeves et al. 2002).

6-7.5 Population Trends

Although the western stock remains a highly endangered population (Clapham et al. 1999), the eastern stock showed such a dramatic population recovery that it was removed from the U.S. List of Endangered and Threatened Wildlife in 1994 (Angliss and Lodge 2004). Overall, the eastern stock increased by approximately 2.5 percent/year from the mid-1960s to 1999 when the population was estimated at 26,600 (Rugh et al. 1999). reported the stock to be increasing in number at a rate of about 2.5 percent per year and estimated the population to consist of about 26,600 whales. In March of 2002 populations were estimated at about 24,500 whales (Angliss and Lodge 2004), however, recent information indicates that this estimate is probably too high and that numbers may actually be closer to 17,000 to 18,000 animals (Rugh 2004). Rugh speculated that the lower estimates may have resulted from fewer whales migrating south through the California observation site, or represented a real population decline resulting form high mortality observed in 1999 and 2000. Evidence of this high mortality was provided by

Norman et al. (2004) who documented gray whale strandings in the northwest region that were four to five times greater than the annual average rangewide. In addition, some researchers have offered that the eastern North Pacific stock may be reaching its carrying capacity (Rugh et al. 1999).

Calambokidis et al. (2002) estimated the size of the seasonal resident gray whale group to be about 180 individuals, but did not discuss any yearly trends in abundance.

6-7.6 Assessment of Potential Effects from Washington DNR Authorized Activities

Because most of the gray whales migrating past Washington remain 5 to 10 kilometers of the coast (Green et al. 1995), the likelihood that activities authorized by Washington DNR would adversely affect them probably is fairly low. However, there is the potential for some activities authorized by Washington DNR to affect seasonal residents, transients and other gray whales that enter the inland waters of the State. Potential impacts include alterations of the sediment regime and/or coastal feeding areas resulting from new overwater structures, shoreline modifications, and dredging and/or disposal of dredged material; injury from acoustic harassment devices associated with aquaculture facilities; and collisions with boats associated with marinas and terminals.

6-7.7 Species Coverage Recommendation and Justification

It is recommended that the gray whale be considered a **Watch-list Species** because 1) The eastern North Pacific gray whale stock is not listed by either the state of federal government; 2) Activities authorized by Washington DNR have a "medium" potential to affect seasonal resident gray whales and some migrating whales; and 3) Sufficient information is available to assess impacts and to develop conservation measures for the entire stock.

However, there may not be enough information to adequately assess the potential for impacts to the seasonal resident group and as a result, this coverage recommendation should be reconsidered if the seasonal resident group is determined to be a population distinct from the main migratory group of whales.

6-7.8 References

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6-8 North Pacific Right Whale

6-8.1 Species Name

Eubalaena japonica

Common Name: North Pacific right whale

Initial coverage recommendation: Evaluation

6-8.2 Status and Rank

See glossary for listing and ranking definitions and criteria.

FEDERAL STATUS (NOAA FISHERIES)

Endangered (1970)

WASHINGTON DEPARTMENT OF FISH AND WILDLIFE STATUS

Endangered

NATURAL HERITAGE PROGRAM GLOBAL RANK

G1

NATURAL HERITAGE PROGRAM STATE RANK

Not Ranked

6-8.3 Range

Right whales are distributed throughout the oceans and the historic range of the North Pacific right whale probably included much of the northern Pacific (National Marine Fisheries Service 2002). A small area on the middle shelf of the southeastern Bering Sea, north of the Aleutian Islands (Goddard and Rugh 1998) has provided the most consistent sightings of North Pacific right whales since 1980 (Sheldon et al. 2005) and the area has become a focal point for acoustic and population surveys (Tynan et al. 2001; McDonald and Moore 2002).

There are no recent records documenting the presence of the species in Washington State waters, with only three record sightings occurring off the Oregon and Washington coasts since the 1950s (North Pacific Right Whale Recovery Team 2004). Only the 1967 sighting just west of Cape Flattery, appeared to be in Washington State waters. The most

recent sighting was made in 1992 northwest of Gray's Harbor and well off the coast (Rowlett et al. 1994). One unconfirmed sighting was recorded in 1983 in British Columbia waters at the entrance to the Strait of Juan de Fuca (North Pacific Right Whale Recovery Team 2004).

6-8.4 Habitat Use

North Pacific right whales are often found in relatively shallow waters (50 to 80 meters depth) associated with ocean-temperature fronts and water-column stratification that may help concentrate their prey (Tynan et al. 2001). Their habitat is largely determined by the occurrence of the dense groups of zooplankton, particularly calanoid copepods, on which they feed (Tynan et al. 2001; North Pacific Right Whale Recovery Team 2004).

6-8.5 Population Trends

Based on records from the 1840s, National Marine Fisheries Service (1991) estimated that pre-whaling populations of North Pacific right whales exceeded 11,000 individuals. Currently, the eastern Pacific population is considered to be among the most endangered baleen whale populations (Clapham et al. 1999), and in 2002 the National Marine Fisheries Service reported that a reliable estimate of the minimum population size could not be made and that only 14 individuals had been observed during aerial surveys conducted from 1998 to 2000.

6-8.6 Species Coverage Recommendation and Justification

It is recommended that the North Pacific right whale be considered a **Watch-list Species** because: 1) There are no recent records documenting the presence of the species in Washington State waters.

6-8.7 References

Clapham, P.J., S.B. Young, and R.L. Brownell. 1999. Baleen Whales: Conservation Issues and the Status of the Most Endangered Populations. Mammal Review 29(1): 35-60.

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